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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER

ART UNIT

PAPER NUMBER

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.  
**09/293,188**

Applicant(s)  
**Yin et al.**

Examiner  
**Phat X. Cao**

Art Unit  
**2814**



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on Jun 1, 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 7-10, and 15-28 is/are pending in the application.
- 4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 7-10, and 15-20 is/are rejected.
- 7) ☒ Claim(s) 21-28 is/are objected to.
- 8) Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some\* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \*See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

- 15) ☐ Notice of References Cited (PTO-892) 18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 19) ☐ Notice of Informal Patent Application (PTO-152)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_ 20) ☐ Other: \_\_\_\_\_

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### DETAILED ACTION

1. The cancellation of claims 3-6, and 11-14 in Paper No. 10 is acknowledged.

#### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-2, 7-10, and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekiguchi et al (US. 5,780,908) in view of Hong et al (US. 6,077,774).

Sekiguchi et al disclose in Fig. 3(b) a semiconductor structure comprising: an electrically conductive interconnect disposed within a first dielectric layer 4, the electrically conductive interconnect having an upper surface and including: a titanium/titanium nitride bilayer film 6 disposed within a depression in the first dielectric layer 4; a tungsten film 7 disposed upon the titanium/titanium nitride bilayer film 6 and filling the depression; a passivation layer 7b of tungsten nitride layer, disposed upon the upper surface and having a thickness of less than 50 angstroms (column 16, lines 20-24), the passivation layer 7b formed by exposing the surface of the electrically conductive interconnect 7 to plasma in an atmosphere of ammonia (NH<sub>4</sub>) for nitriding an area in the vicinity of the surface of the electrically conductive interconnect 7 (column 15, lines

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50-54). Therefore, the passivation layer 7b of tungsten nitride would inherently comprise ammonia (NH<sub>4</sub>) adsorbed upon the upper surface. It is noted that a first passivation layer comprising tungsten nitride and a second passivation layer comprising ammonia as claimed in claims 7, 15, 17, and 19 do not distinguish from the passivation layer 7b of tungsten nitride comprising ammonia (NH<sub>4</sub>) of Sekiguchi because the passivation layer 7b is produced by the same processes which are used to produce first and second passivation layers as claimed (i.e., exposing the surface of conductive interconnect in an atmosphere of ammonia).

Sekiguchi et al do not disclose an ILD disposed upon the first dielectric layer 4 and being continuously adhered to the upper surface.

However, Hong et al teach in Fig. 1F the obviousness of forming an ILD 36 upon the dielectric layer 12 and continuously adhered to the upper surface of the electrically conductive interconnect 30. Accordingly, it would have been obvious to form an ILD upon the dielectric layer 4 and continuously adhered to the upper surface of the electrically conductive interconnect 7 of Sekiguchi, because the ILD would provide the known purpose of isolating and protecting the electrically conductive interconnect from the outside ambient.

4. Claims 1-2, 7-10, and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekiguchi et al (US. 5,780,908) in view of Liao (US. 6,114,238).

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As discussed above, Fig. 3(b) of Sekiguchi et al substantially reads on the above claims, except it does not disclose an ILD disposed upon the first dielectric layer and being continuously adhered to the upper surface of the conductive interconnect.

However, in view of Fig. 1 of Liao, it would have been obvious to form an ILD upon the dielectric layer 4 and continuously adhered to the upper surface of the conductive interconnect 7 of Sekiguchi, because the ILD would provide the known purpose of isolating and protecting the electrically conductive interconnect from the outside ambient.

#### ***Allowable Subject Matter***

5. Claims 21-28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record fails to disclose all the limitations recited in the above claims, including the limitation of having ammonia derivative comprising nitrogen-containing silane.

#### ***Response to Arguments***

6. Applicant's arguments with respect to the claimed invention have been considered but are moot in view of the new ground(s) of rejection.

Applicant asserted that claims 1-2, 7-10, and 15-16 should be in condition for allowance because independent claims 7-8 and 15-16 are indicated allowable by the Examiner in the last

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Office action, and because independent claims 1 and 9 has been rewritten to incorporate the limitations of dependent claims which the Examiner has indicated contains allowable subject matter.

However, the indication of allowability of independent claims 7-8, 15-16, 1, and 9 are withdrawn because the scopes of the above claims are changed by replacing "ammonia and its derivatives" with "ammonia or derivatives thereof" in amendment filed 6/1/01. Therefore, the new ground of rejection is applied.

### *Conclusion*

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (703) 308-4917. The Examiner can normally be reached on Monday through Thursday. If attempts to reach the Examiner by telephone are unsuccessfully, the Examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. Group 2800 fax number is (703) 308-7722 or (703) 308-7724.

PC  
July 31, 2001

  
Cao, Phat X.  
Patent Examiner  
Technology Center 2800